Site Preparation Guide

hp rp7405/rp7410 Servers

Second Edition

Manufacturing Part Number: A6752-96009
21102

USA

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Preface

Revision History

Table 1 Revisions

Revision	Part Number	Release Date	Description
Second	A6752-96003	November 2002	Made general updates and corrections throughout book
First	A6752-96003	August 2002	Initial Release

Notational Conventions

WARNING	**Warnings highlight procedures or information necessary to avoid injury to personnel. The warning should tell the reader exactly what will result from what actions and how to avoid them.**

CAUTION	A caution highlights procedures or information necessary to avoid damage to equipment, damage to software, loss of data, or invalid test results.

NOTE	A note highlights supplemental information.

Safety and Regulatory

Regulatory Model: RSVLA-0102

For your protection, this product has been tested to various national and international regulations and standards. The scope of this regulatory testing includes electrical/mechanical safety, radio frequency interference, acoustics, and know hazardous materials.Where applicable, approvals obtained from third-party test agencies are shown on the product label.

Safety in Material Handling

WARNING	**Do not lift the cabinet manually. To avoid physical injury you must use a mechanical lifting device.**

WARNING	**Use care when working with hazardous voltages. This equipment may be configured with dual input line sources. Hazardous voltages and energy maybe present even after the removal of a single input source. Trained service personnel must follow the service guidelines.**

WARNING	**Do not stand in front of the equipment as it is rolled off the pallet onto the ramps. When removing the equipment from the shipping pallet, follow the guidelines specified in the Installation Procedures section of the appropriate equipment guides.**

NOTE	Electrical practices and suggestions in this guide are based on North American practices. For countries outside North America, local electrical codes will take precedence over North American electrical codes. An example would be the recommendation that the PE (protective earthing) conductor be green with yellow stripes. This requirement is a North American directive and does not override the local code requirements for a country outside North America.

Throughout this manual, the [LAHJ] acronym will be used to indicate Local Authority Has Jurisdiction.

Figure 1 Declaration of Conformity

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company
Internet & Applications Systems Division

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95747
USA

declares, that the product

Product Name: HP Server rp7410

Regulatory Model: RSVLA-0102-xx (where -xx is an optional suffix and x is any letter or blank)

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 60950:1991+A1+A2 +A3 +A4 /
EN 60950: 1992+A1+A2 +A3 +A4 +A11
IEC 60825-1:1993 +A1 / EN 60825-1:1994+A11, Class 1
GB 4943-1995

EMC: CISPR 22:1997 / EN 55022:1998 Class A [1)]
CISPR 24:1997 / EN 55024:1998

IEC 61000-3-2:1995 / EN 61000-3-2:1995 +A14
IEC 61000-3-3:1994 / EN 61000-3-3:1995
GB 9254-1988

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

1) The product was tested in a typical configuration with Hewlett-Packard computer peripherals.

2) DC versions of the product were tested in a typical configuration with a Hewlett-Packard 6813A AC/DC power source.

Roseville, 12/1/01

Frank D. Dembski Jr., Quality Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)

USA Radio Frequency Interference FCC Notice

The Federal Communications Commission (in 47 CFR Part 15 subpart B) has specified that the following notice be brought to the attention of the users of this product.

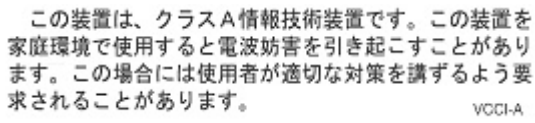
NOTE This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes or modifications not expressly approved by Hewlett-Packard could result in the equipment being noncompliant with FCC Class A requirements and void the user's authority to operated the equipment.

Japanese Radio Frequency Interference VCCI

This equipment is in the Class A category information technology equipment based on the rules of Voluntary Control Council For Interference by Information Technology Equipment (VCCI). When used in a residential area, radio interference may be caused. In this case, user may be required to take appropriate corrective actions.

Figure 2 Japanese RFI

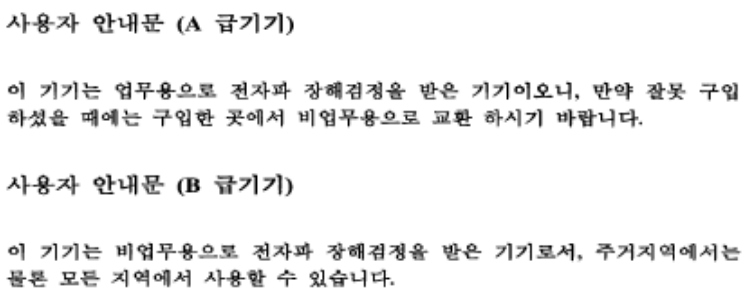


Korean RFI Statement

Certification Number: E - AAAAA - BB - CCCC

- E: EMC registration
- AAAAA: equipment codes (RRL notice, 2000.10.26)
- BB: certification year
- CCCC: registration number

Figure 3 Korean RFI


사용자 안내문 (A 급기기)

이 기기는 업무용으로 전자파 장해검정을 받은 기기이오니, 만약 잘못 구입
하셨을 때에는 구입한 곳에서 비업무용으로 교환 하시기 바랍니다.

사용자 안내문 (B 급기기)

이 기기는 비업무용으로 전자파 장해검정을 받은 기기로서, 주거지역에서는
물론 모든 지역에서 사용할 수 있습니다.

Translation

Class A Equipment:

Please note that this equipment has been approved for business purpose with regards to electromagnetic interference, if purchased un error for use in residential area, you may wish to exchange the equipment where you purchase it.

Class B Equipment:

Please note that this equipment has been approved for non-business with regards to electromagnetic interference. So, this equipment can be allowed to use all area as well as residential area.

European Union RFI Statement

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Canada RFI Statement

This Class A digital apparatus complies with Canadian ICES-003.

Notice relative aux interférences radioélectriques (Canada)

Cet appareil numéric de la classe A est conforme à la norme NMB-003 du Canada.

BSMI (Taiwan Area)

This product is fully compliant to CNS 13438 (CISPR 22: 1993) Class A. The EMC label is in the form shown in Figure 4.

Figure 4 Taiwan Area EMC

Acoustics (Germany)

Acoustic Noise (A-weighted Sound Pressure Level LpA) measured at the bystander position, normal operation, to ISO 7779: LpA = 59 dB.

Geräuschemission (Deutschland)

Lärmangabe (Schalldruckpegel LpA) gemessen am fiktiven Arbeitsplatz bei normalem Betrieb nach DIN 45635, Teil 19: LpA = 59 dB.

IT Power System

This product has not been evaluated for connection to an IT power system (an AC distribution system having no direct connection to earth according to IEC 60950).

TT, TN-C, and TN-C-S Power Systems

These products should not be connected to power systems that switch open the return lead when the return lead also functions as the protective earth (PE). A separate PE ground wire must be connected to the equipment at the designated PE terminal tie point.

Installation Conditions

See installation instructions before connecting this equipment to the input supply.

Voir la notice d'installation avant de raccorder au réseau.

WARNING NORDIC Class 1 Equipment

Denmark: Før tilslutning af de øvrige ledere, se medfølgende installationsvejledning.

WARNING NORDIC Class 1 Equipment

Sweden: Apparaten skall anslutas till jordat uttag, när den ansluts till ett nätverk.

Network Connected Equipment

The installation must provide a ground connection for the network equipment.

CAUTION Sweden: Apparaten skall anslutas till jordat uttang när deb abskuts till ett nätverk.

CAUTION Norway: Apparaten skall anslutas till jordat uttang nar deb abskuts till ett natverk.

Lithium Battery Caution

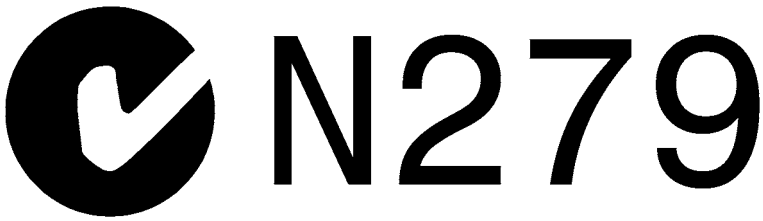
WARNING **Observe the correct polarity when changing the lithium battery. There is a danger of explosion if battery is installed incorrectly.**

Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and local disposal requirements.

IMPORTANT Switzerland: Annex 4.10 of SR 814.013 applies to batteries.

Australian C-Tick Label

Figure 5 C-Tick Label



Laser Safety

NOTE If a Fibre Channel I/O card is present, the following laser safety statement applies.

This product contains a laser internal to the Optical Link Module (OLM) for connection to the Fibre communications port.

In the USA, the OLM is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the plastic OLM housing.

Outside the USA, the OLM is certified as a Class 1 laser product conforming to the requirements contained in IEC 60825-1:1993 and EN 60825-1:1994, including Amendment 11:1996.

NOTE If a DVD is present, the following laser safety statement applies.

This product contains a laser internal to the Digital Versatile Disc (DVD) housing.

In the USA, the DVD is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the DVD housing.

Outside the USA, the DVD is certified as a Class 1 laser product conforming to the requirements contained in IEC 60825-1:1993+A1 and EN 60825-1:1994+A11.

1 System Specifications

Dimensions and Weights

This section provides dimensions and weights of the system components.

Table 1-1 hp rp7405/rp7410 Server Dimensions and Weights

	Standalone	Packaged
Height - Inches (centimeters)	17.3 (43.9)	35.75 (90.8)
Width - Inches (centimeters)	17.5 (44.4)	28.0 (71.1)
Depth - Inches (centimeters)	30.0 (76.2)	28.38 (72.0)
Weight - Pounds (kilograms)	220 (100)	N./A

Shipping box, pallet, ramp, and container adds approximately 50 lbs to the total system weight. The size and number of miscellaneous pallets will be determined by the equipment ordered by the customer.

Table 1-2 hp rp7405/rp7410 Component Weights

Quantity	Description	Weight (lb/kg.)
1 or 2	Cell board	19.81 (9.0)
1	System backplane	12 (estimate) 5.44 (estimate)
1	PCI backplane	20.4 (9.25)
2	Bulk power supply	18 (8.2)
1	Mass storage backplane	1 (0.45)
2	PCI DC-to-DC converters	5 (2.27)

Electrical Specifications

This section provides electrical specifications for hp rp7405/rp7410 servers.

Grounding

The site building shall provide a safety ground/protective earth for each AC service entrance to all cabinets.

Install a PE (protective earthing) conductor that is identical in size, insulation material, and thickness to the branch-circuit supply conductors. The PE conductor must be green with yellow stripes. The earthing conductor described is to be connected from the unit to the building installation earth or, if supplied by a separately derived system, at the supply transformer or motor-generator set grounding point.

Circuit Breaker

The Marked Electrical for the hp rp7405/rp7410 server is 12 amps. The recommended circuit breaker size is 20 amps for North America. For countries outside North America, consult your local electrical authority having jurisdiction for the recommended circuit breaker size.

System AC Power Specifications

Power Cords

The supplied power cord length is 15 feet (457.4 cm). Table 1-3 lists the various power cables available for use with a hp rp7405/rp7410 system. Each power cord is 15 feet (4.5 meters) in length with a IEC 60320-1 C19 female connector attached to one end.

Table 1-3 Power Cords

Part Number	Description	Where Used
8120-6895	Stripped end, 240 volt	International-Europe
8120-6897	Male IEC309, 240 volt	International
8121-0070	Male GB-1002, 240 volts	China
8120-6899	Male CEEE 7/7, 240 volt	Continental Europe
8121-0558	Male ISI-32, 240 volts	Israel
8120-6903	Male NEMA L6-20, 240 volt	North America/Japan

System Power Specifications

Table 1-4 and Table 1-5 list the AC power requirements for the server. These tables provide information to help determine the amount of AC power needed for your computer room.

Table 1-4 AC Power Specifications

Requirements	Value	Comments
Nominal input voltage	200, 208, 220, 240 VAC	

Table 1-4 AC Power Specifications (Continued)

Requirements	Value	Comments
Minimum Operating Voltage	180 VAC	
Maximum Operating Voltage	269 VAC	
Frequency range (minimum - maximum)	50 - 60 (Hz)	
Number of phases	1	
Rated line current	12 A rms	
Maximum inrush current	30 A peak for 15 ms	Per line cord
Dropout carry-through time at minimum line voltage	20 ms	
Circuit breaker rating	20 A	Per line cord
Branch Circuit Breaker (Size, Type)	20A, slow trip delay type	
Power factor correction	>0.97 @269VAC >0.93 @262VAC	At all loads of 50% - 100% of supply rating At all loads 0f 30% - 50% of supply rating
Ground leakage current (mA)	<3.0 (ma)	Per line cord
kVA rating	2.7 KVA	

Table 1-5 System Power Requirements

Power Required (50 - 60 Hz)	VA	Comments
Maximum configuration hp rp7405/rp7410 server PA8700	3000	Theoretical
Typical configuration hp rp7405/rp7410 server PA8700	1700	Typical

Future upgrades may increase the Maximum Theoretical System Power to 3400 VA.

Maximum power is the sum of the worst case power consumption of every subsystem in the box, and should be used to size worst case power consumption for facility installation. Typical power consumption numbers are what HP engineers have measured running power intensive applications. These are generally lower than maximum power numbers due to the fact that getting all of the subsystems in the box to simultaneously draw maximum power for long durations being uncommon.

Environmental Specifications

This section provides the environmental, power dissipation, noise emission, and air flow specifications for the hp rp7405/rp7410 server.

Temperature and Humidity

The cabinet is actively cooled using forced convection in a Class C1-modified environment.

Operating Environment

The system is designed to run continuously and meet reliability goals in an ambient temperature of 5° C - 35° C at sea level. The maximum allowable temperature is derated 1° C per 1000 feet of elevation above 5000 feet above sea level up to 30° C at 10,000 feet. For optimum reliability and performance, the recommended operating range is 20° C to 25° C

Environmental Temperature Sensor

To ensure that the system is operating within the published limits, the ambient operating temperature is measured using a sensor placed near the chassis inlet, between the cell boards. Data from the sensor is used to control the fan speed and also to initiate system overtemp shutdown. (For more details see the platform management section.)

Non-Operating Environment

The system is designed to withstand ambient temperatures between -40° C to 70° C under non-operating conditions.

Cooling

Cell Section Cooling

The cabinet incorporates front to back airflow across the cell boards and system backplane. Two (2) 150mm fans, mounted externally on the front chassis wall behind the cosmetic front bezel, push air into the Cell section; and two (2) 150mm fans housed in cosmetic plastic fan carriers and mounted externally to the rear chassis wall, pull air through the Cell section.

Each cell area fan cooling is controlled by a smart fan control board, embedded in the fan module plastic housing. The smart fan control board receives fan control input from the system fan controller on the system backplane and returns fan status information to the system fan controller. The smart fan control board also controls the power and the pulse width modulated control signal to the fan and monitors the speed indicator back from the fan. The fan status LED is driven by the smart fan control board.

Bulk Power Supply Cooling

Cooling for the bulk power supplies is provided by two (2) 60mm fans contained within each BPS. Air flows into the front of the BPS and is exhausted out of the top of the power supply though upward facing vents near the rear of the supply. The air is then ducted out of the rear of the chassis with minimal leakage into the cell airflow plenum.

PCI/Mass Storage Section Cooling

Six (6) 92mm fans located between the Mass Storage Devices and the PCI Card Cage provide airflow through these devices. The PCI fans are powered off of housekeeping power and + run at full speed at all times. The air is pulled through the mass storage devices and pushed through the PCI Card Cage. Perforation is provided between the PCI bulkheads to allow adequate exhaust ventilation and to help reduce the localized airflow dead spots that typically occur at the faceplate tail of each PCI card.

Standby Cooling

Several components within the chassis consume significant amounts of power while the system is in standby mode. The system fans will be run at 1541 rpm, or 38% of full speed, during standby to remove the resulting heat from the cabinet. The fans within the power supply will operate at full speed during standby.

Typical Power Dissipation and Cooling

Table 1-6 Typical hp rp7405/rp7410 Configurations

Cell Boards	Memory Per Cell Board	PCI Cards (assumes 10 watts each)	DVDs	Hard Disk Drives	Core I/O	Bulk Power Supplies	Typical Power	Typical Cooling
Qty	GBytes	Qty	Qty	Qty	Qty	Qty	Watts	BTU/Hr
2	16	16	2	4	2	2	2000	6826
2	8	8	0	2	2	2	1810	6179
2	4	8	0	2	2	2	1757	5998
1	4	8	0	1	1	2	1148	3919

Acoustic Noise Specification

The acoustic noise specification for the hp rp7410 server is 57.3 db (sound pressure level at bystander position) It is appropriate for dedicated computer room environments, not office environments. The LwA is 7.5 Bels. Care should be taken to understand the acoustic noise specifications relative to operator positions within the computer room or when adding servers to computer rooms with existing noise sources.

Air Flow

The hp rp7405/rp7410 servers require that the cabinet air intake temperature be between 68° F and 77° F (20° C and 25° C) at 960 CFM.

Figure 1-1 illustrates the location of the inlet and outlet airducts on a single cabinet.

Figure 1-1 Airflow Diagram

2 Facility Guidelines

Electrical Considerations

Proper design and installation of a power distribution system for an hp rp7405/rp7410 server requires specialized skills. Those responsible for this task must have a thorough knowledge and understanding of appropriate electrical codes and the limitations of the power systems for computer and data processing equipment.

In general, a well-designed power distribution system exceeds the requirements of most electrical codes. A good design, when coupled with proper installation practices, produces the most trouble-free operation.

The electrical factors discussed in this section are:

A detailed discussion of power distribution system design and installation is beyond the scope of this document. However, electrical factors relating to power distribution system design and installation must be considered during the site preparation process.

- Computer room safety
- Electrical load requirements (circuit breaker sizing)
- Power quality
- Distribution hardware
- System installation guidelines

Electrical Load Requirements (Circuit Breaker Sizing)

It is always a good idea to derate power distribution systems for one or more of the following reasons:

- To avoid nuisance tripping from load shifts or power transients, circuit protection devices should never be run above 80% of their root-mean-square (RMS) current ratings.
- Safety agencies derate most power connectors to 80% of their RMS current ratings.

Power Quality

This equipment is designed to operate over a wide range of voltages and frequencies. It has been tested and shown to comply with EMC Specification EN50082. However, damage can occur if these ranges are exceeded. Severe electrical disturbances can exceed the design specifications of the equipment.

Sources of Electrical Disturbances

Electrical disturbances, sometimes called glitches, affect the quality of electrical power. Common sources of these disturbances are:

- Fluctuations occurring within the facility's distribution system
- Utility service low-voltage conditions (such as sags or brownouts)
- Wide and rapid variations in input voltage levels
- Wide and rapid variations in input power frequency
- Electrical storms
- Large inductive sources (such as motors and welders)
- Faults in the distribution system wiring (such as loose connections)
- Microwave, radar, radio, or cell phone transmissions

Power System Protection

Computer systems can be protected from the sources of many of these electrical disturbances by using:

- A dedicated power distribution system
- Power conditioning equipment
- Over- and under-voltage detection and protection circuits
- Screening to cancel out the effects of undesirable transmissions
- Lightning arresters on power cables to protect equipment against electrical storms

Every precaution has been taken during power distribution system design to provide immunity to power outages of less than one cycle. However, testing cannot conclusively rule out loss of service. Therefore, adherence to the following guidelines provides the best possible performance of power distribution systems for server equipment:

- Dedicated power source—Isolates server power distribution system from other circuits in the facility.
- Missing-phase and low-voltage detectors—Shuts equipment down automatically when a severe power disruption occurs. For peripheral equipment, these devices are recommended but optional.
- Online uninterruptible power supply (UPS)—Keeps input voltage to devices constant and should be considered if outages of one-half cycle or more are common. Refer to qualified contractors or consultants for each situation.

Distribution Hardware

This section describes wire selection and the types of raceways (electrical conduits) used in the distribution system.

Wire Selection

Use copper conductors instead of aluminum, as aluminum's coefficient of expansion differs significantly from that of other metals used in power hardware. Because of this difference, aluminum conductors can cause connector hardware to work loose, overheat, and fail.

Raceway Systems (electrical conduits)

Raceways (electrical conduits) form part of the protective ground path for personnel and equipment. Raceways protect the wiring from accidental damage and also provide a heatsink for the wires.

Any of the following types may be used:

- Electrical metallic tubing (EMT) thin-wall tubing
- Rigid (metal) conduit
- Liquidtight with RFI strain relief (most commonly used with raised floors)

Building Distribution

All building feeders and branch circuitry should be in rigid metallic conduit with proper connectors (to provide ground continuity) Conduit that is exposed and subject to damage should be constructed of rigid galvanized steel.

Power Routing

Power drops and interface cables from the equipment are routed down from the power panel, through a grommet protected opening (beneath the floor level), and under the floor panels.

Grounding Systems

hp rp7405/rp7410 servers require two methods of grounding:

- Power distribution safety grounding
- High frequency intercabinet grounding

Power Distribution Safety Grounding

The power distribution safety grounding system consists of connecting various points in the power distribution system to earth ground using green (green/yellow) wire ground conductors. Having these ground connections tied to metal chassis parts that may be touched by computer room personnel protects them against shock hazard from current leakage and fault conditions.

Power distribution systems consist of several parts. Hewlett-Packard recommends that these parts be solidly interconnected to provide an equipotential ground to all points.

Main Building Electrical Ground

The main electrical service entrance equipment should have an earth ground connection, as required by applicable codes. Connections such as a grounding rod, building steel, or a conductive type cold water service pipe provide an earth ground.

Electrical Conduit Ground

All electrical conduits should be made of rigid metallic conduit that is securely connected together or bonded to panels and electrical boxes, so as to provide a continuous grounding system.

Power Panel Ground

Each power panel should be grounded to the electrical service entrance with green (green/yellow) wire ground conductors. The green (green/yellow) wire ground conductors should be sized per applicable codes (based on circuit over current device ratings).

NOTE The green wire ground conductor mentioned above may be a black wire marked with green tape.

Computer Safety Ground

Ground all computer equipment with the green (green/yellow) wire included in the branch circuitry. The green (green/yellow) wire ground conductors should be connected to the appropriate power panel and should be sized per applicable codes (based on circuit over current device ratings).

Cabinet Performance Grounding (High frequency Ground)

Signal interconnects between system cabinets require high frequency ground return paths. Connect all cabinets to site ground.

NOTE In some cases power distribution system green (green/yellow) wire ground conductors are too long and inductive to provide adequate high frequency ground return paths. Therefore, the server is shipped with a ground strap for connecting the system cabinet to the site grounding grid (customer-supplied). When connecting this ground, ensure that the raised floor is properly grounded.

Power panels located in close proximity to the computer equipment should also be connected to the site grounding grid. Methods of providing a sufficiently high frequency ground grid are described in the next sections.

Raised Floor Grounding

If a raised floor system is used, install a complete signal grounding grid for maintaining equal potential over a broad band of frequencies. The grounding grid should be connected to the equipment cabinet and electrical service entrance ground at multiple connection points using a minimum #6 AWG (16mm2) wire ground conductor.

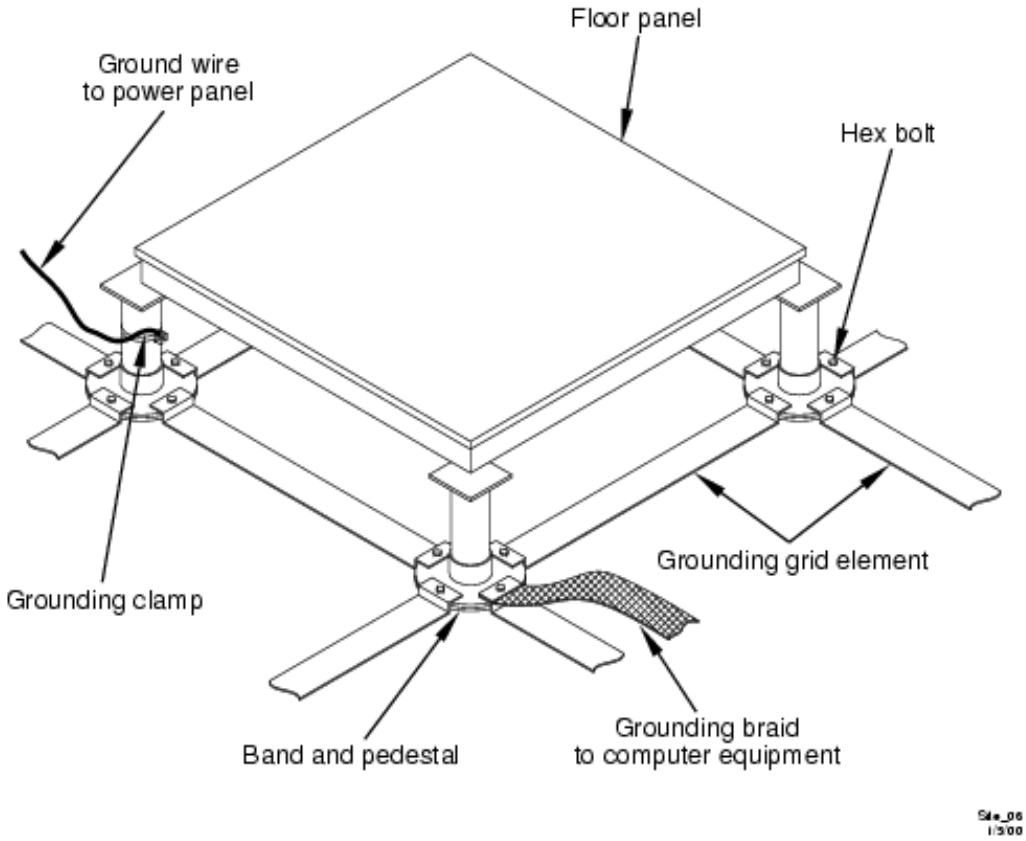
Hewlett-Packard recommends the following approaches:

- Excellent—Add a grounding grid to the subfloor. The grounding grid should be made of aluminum strips mounted to the subfloor. The strips should be 0.032 in. (0.08 cm) thick and a minimum of 3.0 in. (8.0 cm) wide.

  Connect each pedestal to four strips using 1/4 in. (6.0 mm) bolts tightened to the manufacturer's torque recommendation.

- Good—Use the raised floor structure as a ground grid. In this case, the floor must be designed as a ground grid with bolted down stringers and corrosion resistive plating (to provide low resistance and attachment points for connection to service entrance ground and server equipment). The use of conductive floor tiles with this style of grid further enhances ground performance.

Figure 2-1 Raised Floor Ground System



Equipment Grounding Implementation Details

If it has been determined to be necessary, connect all Hewlett-Packard equipment cabinets to the site ground grid as follows:

Step 1. Attach one end of each ground strap to the applicable cabinet ground lug.

Step 2. Attach the other end to the nearest pedestal base (raised floor) or cable trough ground point (nonraised floor).

Step 3. Check that the braid contact on each end of the ground strap consists of a terminal and connection hardware (a 1/4-in. (6.0-mm) bolt, nuts, and washers).

Step 4. Check that the braid contact connection points are free of paint or other insulating material and treated with a contact enhancement compound (similar to Burndy Penetrox).

System Installation Guidelines

This section contains information about installation practices. Some common pitfalls are highlighted. Both power cable and data communications cable installations are discussed.

NOTE In domestic installations, the proper receptacles should be installed prior to the arrival of Hewlett-Packard equipment. Refer to the appropriate installation guide for installation procedures.

Wiring Connections

Expansion and contraction rates vary among different metals. Therefore, the integrity of an electrical connection depends on the restraining force applied. Connections that are too tight compress or deform the hardware and causes it to weaken. This usually leads to high impedance causing circuit breakers to trip.

CAUTION Connections that are too loose have a high resistance that cause serious problems, such as erratic equipment operation. A high resistance connection overheats and sometimes causes fire or high temperatures that can destroy hard-to-replace components such as distribution panels or system bus bars.

Wiring connections must be properly torqued. Many equipment manufacturers specify the proper connection torque values for their hardware.

Ground connections must only be made on a conductive, nonpainted surface. When equipment vibration is present, lockwashers must be used on all connections to prevent connection hardware from working loose.

Data Communications Cables

Power transformers and heavy foot traffic create high energy fields. Route data communications cables away from these areas. Use shielded data communications cables that meet approved industry standards to reduce the effects of external fields.

Environmental Elements

The following environmental elements can affect an hp rp7405/rp7410 server installation:

- Computer room preparation
- Cooling requirements
- Humidity level
- Air conditioning ducts
- Dust and pollution control
- Electrostatic discharge (ESD) prevention
- Acoustics (noise reduction)

Computer Room Preparation

The following guidelines are recommended when preparing a computer room for an hp rp7405/rp7410 server system:

- Locate the computer room away from the exterior walls of the building to avoid the heat gain from windows and exterior wall surfaces.
- When exterior windows are unavoidable, use windows that are double or triple glazed and shaded to prevent direct sunlight from entering the computer room.
- Maintain the computer room at a positive pressure relative to surrounding spaces.
- Use a vapor barrier installed around the entire computer room envelope to restrain moisture migration.
- Caulk and vapor seal all pipes and cables that penetrate the envelope.
- Use at least a 12-inch raised floor system for the most favorable room air distribution system (underfloor distribution).
- Ensure a minimum ceiling height of 12 inches between the top of the server and the ceiling and that all ceiling clips are in place.

Basic Air Conditioning Equipment Requirements

The cooling capacity of the installed air conditioning equipment for the computer room should be sufficient to offset the computer equipment dissipation loads, as well as any space envelope heat gain. This equipment should include:

- Air filtration
- Cooling or dehumidification
- Humidification
- Reheating
- Air distribution
- System controls adequate to maintain the computer room within the operating range.

Lighting and personnel must also be included. For example, a person dissipates about 450 BTUs per hour while performing a typical computer room task.

At altitudes above 5,000 feet (3048 m), the lower air density reduces the cooling capability of air conditioning systems. If your facility is located above this altitude, the recommended temperature ranges may need to be modified. For each 1000 feet (305 m) increase in altitude above 5,000 feet (up to a maximum of 10,000 feet), subtract 1.0° C from the upper limit of the temperature range.

Air Conditioning System Guidelines

The following guidelines are recommended when designing an air conditioning system and selecting the necessary equipment:

- The air conditioning system that serves the computer room should be capable of operating 24 hours a day, 365 days a year. It should also be independent of other systems in the building.
- Consider the long-term value of computer system availability, redundant air conditioning equipment or capacity.
- The system should be capable of handling any future computer system expansion.
- Air conditioning equipment air filters should have a minimum rating of 45% (based on "AShRA Standard 52-76, Dust Spot Efficiency Test").
- Introduce only enough outside air into the system to meet building code requirements (for human occupancy) and to maintain a positive air pressure in the computer room.

Air Conditioning System Types

The following three air conditioning system types are listed in order of preference:

- Complete self-contained package unit(s) with remote condenser(s)—These systems are available with up or down discharge and are usually located in the computer room.
- Chilled water package unit with remote chilled water plant—These systems are available with up or down discharge and are usually located in the computer room.
- Central station air handling units with remote refrigeration equipment—These systems are usually located outside the computer room
- Scalable overhead distribution system—This system distributes water overhead to air heat exchangers, which cool the air locally over the servers. This system called DataCool™ is primarily used in high density environments of 100 to 500 watts per square foot.

Basic Air Distribution Systems

A basic air distribution system includes supply air and return air.

An air distribution system should be zoned to deliver an adequate amount of supply air to the cooling air intake vents of the computer system equipment cabinets. Supply air temperature should be maintained within the following parameters:

- Ceiling supply system—From 55° F (12.8° C) to 60° F (15.6° C)
- Floor supply system—At least 60° F (15.6° C)

If a ceiling plenum return air system or a ducted ceiling return air system is used, the return air grille(s) in the ceiling should be located directly above the computer equipment cabinets.

The following three types of air distribution system are listed in order of recommendation:

- Underfloor air distribution system—Downflow air conditioning equipment located on the raised floor of the computer room uses the cavity beneath the raised floor as plenum for the supply air.

  Perforated floor panels (available from the raised floor manufacturer) should be located around the perimeter of the system cabinets. Supply air emitted though the perforated floor panels is then available near the cooling air intake vents of the computer system cabinets.

- Ceiling plenum air distribution system—Supply air is ducted into the ceiling plenum from upflow air conditioning equipment located in the computer room or from an air handling unit (remote).

  The ceiling construction should resist air leakage. Place perforated ceiling panels (with down discharge air flow characteristics) around the perimeter of the system cabinets. The supply air emitted downward from the perforated ceiling panels is then available near the cooling air intake vents of the computer system cabinets.

  Return air should be ducted back to the air conditioning equipment though the return air duct above the ceiling.

- Above ceiling ducted air distribution system—Supply air is ducted into a ceiling diffuser system from upflow air conditioning equipment located in the computer room or from an air handling unit (remote).

  Adjust the supply air diffuser system grilles to direct the cooling air downward around the perimeter of the computer system cabinets. The supply air is then available near the cooling air intake vents of the computer system cabinets.

Table 2-1 Computer Room Environment

Parameter	Operating Limits	Recommended Operating Range	Maximum Rate of Change (per hour)	Non-Operating Ranges
Temperature[a]	41° - 95° F (5° - 35° C)	68° - 77° F (20° - 25° C)	20° C/hr (no tape media) 10° C/hr (with tape media)	-40° C - +70° C
Humidity	15% - 80% with no condensation (40% - 55% recommended)	40% - 55% RH non-condensing	30% RH/hour non-condensing	90% RH non-condensing @ 65° C (149° F)

a. The temperature ranges stated are at 0 to 5,000 feet. The maximum operating temperature must be de-rated by 1° C/1,000 feet from 5,000 to 10,000 feet.

Air Conditioning System Installation

All air conditioning equipment, materials, and installation must comply with any applicable construction codes. Installation of the various components of the air conditioning system must also conform to the air conditioning equipment manufacturer's recommendations.

Humidity Level

Maintain proper humidity levels. High humidity causes galvanic actions to occur between some dissimilar metals. This eventually causes a high resistance between connections, leading to equipment failures. High humidity can also have an adverse affect on some magnetic tapes and paper media.

CAUTION Low humidity contributes to undesirably high levels of electrostatic charges. This increases the electrostatic discharge (ESD) voltage potential. ESD can cause component damage during servicing operations. Paper feed problems on high-speed printers are usually encountered in low-humidity environments.

Low humidity levels are often the result of the facility heating system and occur during the cold season. Most heating systems cause air to have a low humidity level, unless the system has a built-in humidifier.

Air Conditioning Ducts

Use separate computer room air conditioning duct work. If it is not separate from the rest of the building, it might be difficult to control cooling and air pressure levels. Duct work seals are important for maintaining a balanced air conditioning system and high static air pressure. Adequate cooling capacity means little if the direction and rate of air flow cannot be controlled because of poor duct sealing. Also, the ducts should not be exposed to warm air, or humidity levels may increase.

Dust and Pollution Control

Computer equipment can be adversely affected by dust and microscopic particles in the site environment.

Specifically, disk drives, tape drives, and some other mechanical devices can have bearing failures resulting from airborne abrasive particles. Dust may also blanket electronic components like printed circuit boards causing premature failure due to excess heat and/or humidity build up on the boards. Other failures to power supplies and other electronic components can be caused by metallically conductive particles. These metallic particles are conductive and can short circuit electronic components. Use every effort to ensure that the environment is as dust and particulant free as possible.

Smaller particles can pass though some filters and, over a period of time, resulting in possible cause problems in mechanical parts. Small dust particles can be prevented from entering the computer room by maintaining its air conditioning system at a high static air pressure level.

Other sources of dust, metallic, conductive, abrasive, and/or microscopic particles can be present. Some sources of these particulants are:

- Subfloor shedding
- Raised floor shedding
- Ceiling tile shedding

These pollutants are not always visible to the naked eye. A good check to determine their possible presence is to check the underside of the tiles. The tile should be shiny, galvanized, and free from rust.

The computer room should be kept clean. The following guidelines are recommended:

- Smoking—Establish a no-smoking policy. Cigarette smoke particles are eight times larger than the clearance between disk drive read/write heads and the disk surface.
- Printer—Locate printers and paper products in a separate room to eliminate paper particulate problems.
- Eating or drinking—Establish a no-eating or drinking policy. Spilled liquids can cause short circuits in equipment such as keyboards.
- Tile floors—Use a dust-absorbent cloth mop rather than a dry mop to clean tile floors.

Special precautions are necessary if the computer room is near a source of air pollution. Some air pollutants, especially hydrogen sulfide (H2S), are not only unpleasant but corrosive as well. Hydrogen sulfide damages wiring and delicate sound equipment. The use of activated charcoal filters reduces this form of air pollution.

Electrostatic Discharge (ESD) Prevention

Static charges (voltage levels) occur when objects are separated or rubbed together. The voltage level of a static charge is determined by the following factors:

- Types of materials
- Relative humidity
- Rate of change or separation

Table 2-2 lists charge levels based on personnel activities and humidity levels.

Table 2-2 Effect of Humidity on ESD Charge Levels

Personnel Activity[a]	Humidity[b] and Charge Levels (voltages)[c]			
	26%	**32%**	**40%**	**50%**
Person walking across a linoleum floor	**6,150 V**	**5,750 V**	**4,625 V**	**3,700 V**
Person walking across a carpeted floor	18,450 V	17,250 V	13,875 V	11,100 V
Person getting up from a plastic chair	24,600 V	23,000 V	18,500 V	14,800 V

a. Source: B.A. Unger, Electrostatic Discharge Failures of Semiconductor Devices (Bell Laboratories, 1981)
b. For the same relative humidity level, a high rate of airflow produces higher static charges than a low airflow rate.
c. Some data in this table has been extrapolated.

Static Protection Measures

Follow these precautions to minimize possible ESD-induced failures in the computer room:

- Install conductive flooring (conductive adhesive must be used when laying tiles).
- Use conductive wax if waxed floors are necessary.
- Ensure that all equipment and flooring are properly grounded and are at the same ground potential.
- Use conductive tables and chairs.
- Use a grounded wrist strap (or other grounding method) when handling circuit boards.
- Store spare electronic modules in antistatic containers.
- Maintain recommended humidity level and airflow rates in the computer room.

Acoustics

Computer equipment and air conditioning blowers cause computer rooms to be noisy. Ambient noise level in a computer room can be reduced as follows:

- Dropped ceiling—Cover with a commercial grade of fire-resistant, acoustic rated, fiberglass ceiling tile.
- Sound deadening—Cover the walls with curtains or other sound deadening material.
- Removable partitions—Use foam rubber models for most effectiveness.

Computer Room Safety

Inside the computer room, fire protection and adequate lighting (for equipment servicing) are important safety considerations. Federal and local safety codes govern computer installations.

Fire Protection

The national Fire Protection Association's Standard for the Protection of Electronic Computer Data Processing Equipment, NFPA 75, contains information on safety monitoring equipment for computer rooms.

Most computer room installations are equipped with the following fire protection devices:

- Smoke detectors
- Fire and temperature alarms
- Fire extinguishing system

Additional safety devices are:

- Circuit breakers
- An emergency power cutoff switch
- Devices specific to the geographic location i.e., earthquake protection

Lighting Requirements for Equipment Servicing

Adequate lighting and utility outlets in a computer room reduce the possibility of accidents during equipment servicing. Safer servicing is also more efficient and, therefore, less costly.

For example, it is difficult to see cable connection points on the hardware if there is not enough light. Adequate lighting reduces the chances of connector damage when cables are installed or removed.

The minimum recommended illumination level is 70 foot-candles (756 lumens per square meter) when the light level is measured at 30 inches (76.2 cm) above the floor.

Facility Characteristics

This section contains information about facility characteristics that must be considered for the installation or operation of an hp rp7405/rp7410 server. Facility characteristics are:

- Floor loading
- Windows
- Altitude effects

Floor Loading

The computer room floor must be able to support the total weight of the installed computer system as well as the weight of the individual cabinets as they are moved into position.

Floor loading is usually not an issue in nonraised floor installations. The information presented in this section is directed toward raised floor installations.

NOTE Any floor system under consideration for an hp rp7405/rp7410 server installation should be verified by an appropriate floor system consultant.

Raised Floor Loading

Raised floor loading is a function of the manufacturer's load specification and the positioning of the equipment relative to the raised floor grid. While Hewlett-Packard cannot assume responsibility for determining the suitability of a particular raised floor system, it does provide information and illustrations for the customer or local agencies to determine installation requirements.

The following guidelines are recommended:

- Because many raised floor systems do not have grid stringers between floor stands, the lateral support for the floor stands depends on adjacent panels being in place. To avoid compromising this type of floor system while gaining under floor access, remove only one floor panel at a time.
- Larger floor grids (bigger panels) are generally rated for lighter loads.

CAUTION Do not install any raised floor system until you have carefully examined it to verify that it is adequate to support the appropriate installation.

Floor Loading Terms

Table 2-3 defines floor loading terms.

Table 2-3 Floor Loading Term Definitions

Term	Definition
Dead load	The weight of the raised panel floor system, including the understructure. Expressed in lb/ft2 (kg/m2).
Live load	The load that the floor system can safely support. Expressed in lb/ft2 (kg/m2).

Table 2-3 Floor Loading Term Definitions (Continued)

Term	Definition
Concentrated load	The load that a floor panel can support on a 1-in2 (6.45 cm2) area at the panel's weakest point (typically the center of the panel), without the surface of the panel deflecting more than a predetermined amount.
Ultimate load	The maximum load (per floor panel) that the floor system can support without failure. Failure expressed by floor panel(s) breaking or bending. Ultimate load is usually stated as load per floor panel.
Rolling load	The load a floor panel can support (without failure) when a wheel of specified diameter and width is rolled across the panel.
Average floor load	Computed by dividing total equipment weight by the area of its footprint. This value is expressed in lb/ft2 (kg/m2).

Average Floor Loading

The average floor load value, defined in Table 2-4, is not appropriate for addressing raised floor ratings at the floor grid spacing level. However, it is useful for determining floor loading at the building level, such as the area of solid floor or span of raised floor tiles covered by the hp rp7405/rp7410 server footprint.

Typical Raised Floor Site

This section contains an example of a computer room raised floor system that is satisfactory for the installation of an hp rp7405/rp7410 server.

Based on specific information provided by Hewlett-Packard, Tate Access Floors has approved its Series 800 all-steel access floor with bolt-together stringers and 24 in. (61.0 cm) by 24 in. (61.0 cm) floor panels.

In the event that the flooring is being replaced or a new floor is being installed, Tate Access Floors recommends its Series 1250 all-steel access floor with bolt-together stringers and 24 in. (61.0 cm) by 24 in. (61.0 cm) floor panels be used to support the server installation.

NOTE If the specific floor being evaluated or considered is other than a Tate Series 800 floor, the specific floor manufacturer must be contacted to evaluate the floor being used.

Table 2-4 lists specifications for the Tate Access Floors Series 800 raised floor system.

Table 2-4 Typical Raised Floor Specifications

Item[a]	Rating
Dead load	7 lb/ft 2 (34.2 kg/m2)
Live load	313 lb/ft 2 (1528.3 kg/m2)
Concentrated load[b]	1250 lb (567 kg)

Table 2-4 Typical Raised Floor Specifications (Continued)

Item[a]	Rating
Ultimate load	4000 lb (1814 kg) per panel
Rolling load	400 lb (181 kg)
Average floor load	500 lb (227 kg)

a. From Table 2-3 on page 25
b. With 0.08 in (0.2 cm) of span maximum deflection

Windows

Avoid housing computers in a room with windows. Sunlight entering a computer room may cause problems. Magnetic tape storage media is damaged if exposed to direct sunlight. Also, the heat generated by sunlight places an additional load on the cooling system.

Space Requirements

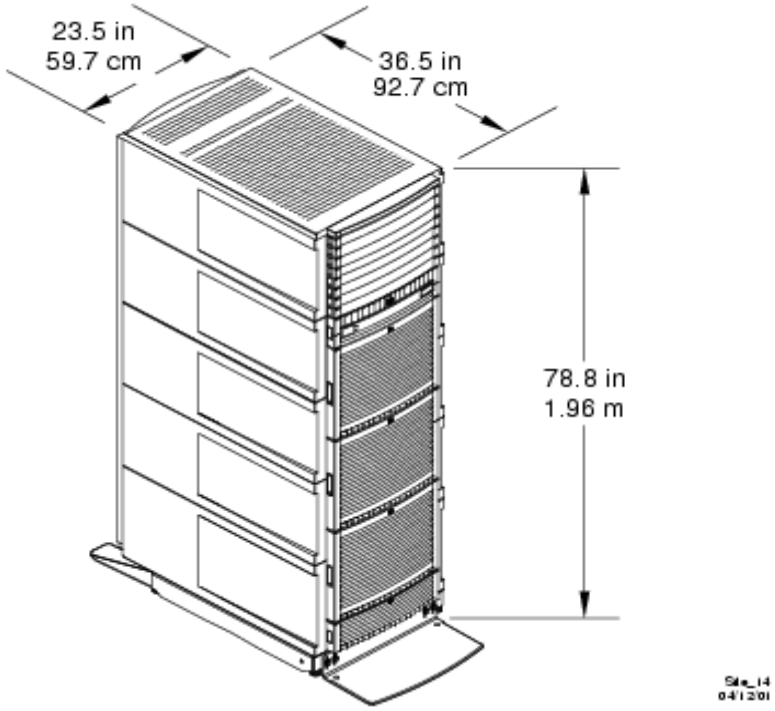
This section contains information about space requirements for an hp rp7405/rp7410 server. This data should be used as the basic guideline for space plan developments. Other factors, such as airflow, lighting, and equipment space requirements must also be considered.

Delivery Space Requirements

There should be enough clearance to move equipment safely from the receiving area to the computer room. Permanent obstructions, such as pillars or narrow doorways, can cause equipment damage.

Delivery plans should include the possible removal of walls or doors.

Figure 2-2 Cabinet Dimensions



Operational Space Requirements

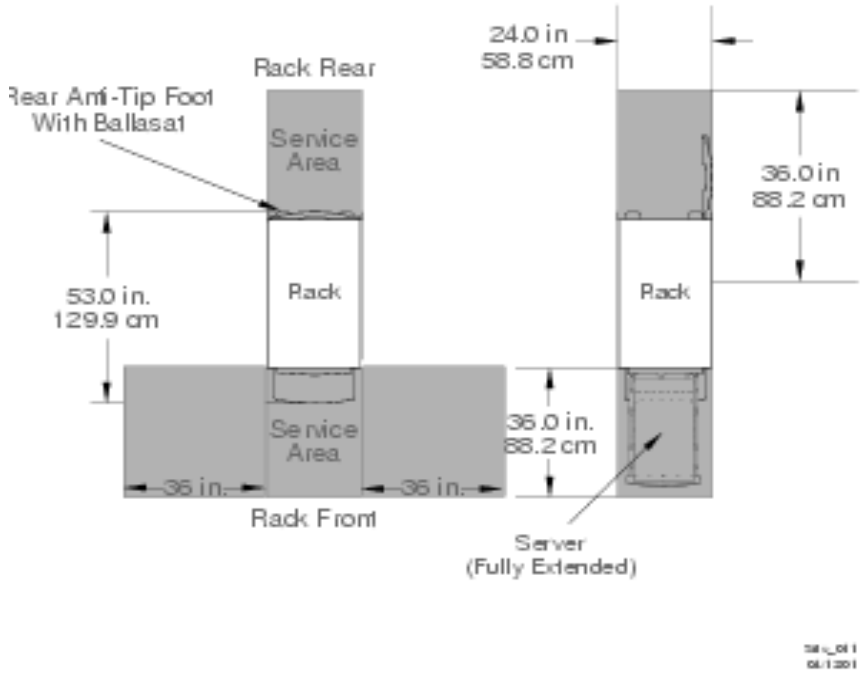
Other factors must be considered along with the basic equipment dimensions. Reduced airflow around equipment causes overheating, which can lead to equipment failure. Therefore, the location and orientation of air conditioning ducts, as well as airflow direction, are important. Obstructions to equipment intake or exhaust airflow must be eliminated.

The locations of lighting fixtures and utility outlets affect servicing operations. Plan equipment layout to take advantage of lighting and utility outlets. Do not forget to include clearance for opening and closing equipment doors.

Clearance around the cabinets must be provided for proper cooling airflow through the equipment.

The service area space requirements, shown in Figure 2-3, are minimum dimensions. If other equipment is located so that it exhausts heated air near the cooling air intakes of the computer system cabinets, larger space requirements are needed to keep ambient air intake to the computer system cabinets within the specified temperature and humidity ranges.

Figure 2-3 Footprint



Space planning should also include the possible addition of equipment or other changes in space requirements. Equipment layout plans should also include provisions for the following:

- Channels or fixtures used for routing data cables and power cables
- Access to air conditioning ducts, filters, lighting, and electrical power hardware
- Power conditioning equipment
- Cabinets for cleaning materials
- Maintenance area and spare parts

Zinc Particle Contamination

Metallic particulates can be especially harmful around electronic equipment. This type of contamination may enter the data center environment from a variety of sources, including but not limited to raised floor tiles, worn air conditioning parts, heating ducts, rotor brushes in vacuum cleaners or printer component wear. Because metallic particulates conduct electricity, they have an increased potential for creating short circuits in electronic equipment. This problem is exaggerated by the increasingly dense circuitry of electronic equipment.

Over time, very fine whiskers of pure metal can form on electroplated zinc, cadmium, or tin surfaces. If these whiskers are disturbed, they may break off and become airborne, possibly causing failures or operational interruptions. For over 50 years, the electronics industry has been aware of the relatively rare but possible threat posed by metallic particulate contamination. During recent years, a growing concern has developed in computer rooms where these conductive contaminants are formed on the bottom of some raised floor tiles.

Although this problem is relatively rare, it may be an issue within your computer room. Since metallic contamination can cause permanent or intermittent failures on your electronic equipment, Hewlett-Packard strongly recommends that your site be evaluated for metallic particulate contamination before installation of electronic equipment.

3 Pre-installation Survey

This chapter provides a site survey information packet consisting of an information form and checklists to be used to evaluate a computer facility. The checklists should be completed and the information sheets and information forms filled out by the customer and a Hewlett-Packard representative.

Pre-installation Survey Content

The site Pre-installation survey information is designed to identify problems that might occur before, during, or after the installation of the system. It contains the following items:

- Pre-installation checklists—Verify that the customer site is ready for the equipment installation.
- Pre-installation survey information sheets—List customer name, address, and corresponding Hewlett-Packard sales personnel.
- Pre-installation survey information forms—List delivery information and special instructions.

Typical Installation Schedule

The following schedule lists the sequence of events for a typical system installation:

- 60 days before installation
  - — Floor plan design completed and mailed to Hewlett-Packard (if required to be an HP task)
- 30 days before installation
  - — Primary power and air conditioning installation completed
  - — Telephone and data cables installed
  - — Fire protection equipment installed
  - — Major facility changes completed
  - — Special delivery requirements defined
  - — Site inspection survey completed
  - — Delivery survey completed
  - — A signed copy of the site inspection and delivery survey mailed to Hewlett-Packard
  - — Site inspection and predelivery coordination meeting arranged with a Hewlett-Packard representative to review the inspection checklist and arrange an installation schedule.
- 7 days before installation
  - — Final check made with an Hewlett-Packard site preparation specialist to resolve any last minute problems

NOTE Not all installations follow a schedule like the one noted above. Sometimes, HP Servers are purchased through another vendor which can preclude a rigid schedule. Other conditions could also prevent following this schedule. For those situations, consider a milestone schedule.

- Site Preparation - schedule with the customer as soon as possible after the order is placed.
- Site Verification - schedule with the customer a minimum of one to two days before the HP Server is scheduled to be installed.

Site Inspection

Table 3-1 contains the basic Customer and Hewlett-Packard information.

Table 3-2 contains the Site Inspection Checklist.

Table 3-1 Customer and Hewlett-Packard Information

Customer Information	
Name:	Phone No:
Street Address:	City or Town:
State or Province:	Country
Zip or postal code:	
Primary customer contact:	Phone No.:
Secondary customer contact:	Phone No.:
Traffic coordinator:	Phone No.:
Hewlett-Packard information	
Sales representative	Order No:
Representative making survey	Date:
Scheduled delivery date	

Table 3-2 Site Inspection Checklist

Please check either Yes or No. If No, include comment# or date				**Comment or Date**
Computer room				
No.	Area or condition	Yes	No	
1.	Is there a completed floor plan?			
2.	Is there adequate space for maintenance needs? Front 36 in (91.4 cm) minimum, Rear 36 in (91.4 cm) minimum are recommended clearances.			
3.	Is access to the site or computer room restricted?			
4.	Is the computer room structurally complete? Expected date of completion?			
5.	Is a raised floor installed and in good condition?			

Table 3-2 Site Inspection Checklist (Continued)

Please check either Yes or No. If No, include comment# or date				**Comment or Date**
6.	Is the raised floor adequate for equipment loading?			
7.	Are there channels or cutouts for cable routing?			
8.	Is there a remote console telephone line available with an RJ11 jack?			
9.	Is a telephone line available?			
10.	Are customer supplied peripheral cables and LAN cables available and of the proper type?			
11.	Are floor tiles in good condition and properly braced?			
12.	Is floor tile underside shiny or painted? If painted, judge the need for particulate test.			
Power and lighting				
No.	Area or condition	Yes	No	
13.	Are lighting levels adequate for maintenance?			
14.	Are there AC outlets available for servicing needs? (i.e. vacuuming)			
15.	Does the input voltage correspond to equipment specifications?			
15A	Is dual source power used? If so, identify type(s) and evaluate grounding.			
16	Does the input frequency correspond to equipment specifications?			
17.	Are lightning arrestors installed inside the building?			
18.	Is power conditioning equipment installed?			
19.	Is there a dedicated branch circuit for equipment?			
20.	Is the dedicated branch circuit less than 250 feet (72.5 meters)?			
21.	Are the input circuit breakers adequate for equipment loads?			
Safety				
No.	Area or condition	Yes	No	

Table 3-2 Site Inspection Checklist (Continued)

Please check either Yes or No. If No, include comment# or date				**Comment or Date**
22.	Is there an emergency power shut-off switch?			
23.	Is there a telephone available for emergency purposes?			
24.	Is there a fire protection system in the computer room?			
25.	Is antistatic flooring installed?			
26.	Are there any equipment servicing hazards (loose ground wires, poor lighting, etc.)?			
Cooling				
No.	Area or condition	Yes	No	
27.	Can cooling be maintained between 20° C and 25° C (up to 5000 ft.)? Derate 1° C/1000 ft. above 5000 ft. and up to 10,000 ft.			
28.	Can temperature changes be held to 10 °C per hour with tape media? Can temperature changes be held to 20 °C per hour without tape media?			
29.	Can humidity level be maintained at 40% to 60% at 35° C non-condensing?			
30.	Are air conditioning filters installed and clean?			
Storage				
No.	Area or condition	Yes	No	
31.	Are cabinets available for tape and disc media?			
32.	Is shelving available for documentation?			
Training				
No.	Area or Condition			
33	Are personnel enrolled in the System Administrator's Course?			
34	Is on-site training required?			

Delivery Survey

The delivery survey form shown in Figure 3-1 on page 38 and Figure 3-2 on page 39 lists delivery or installation requirements. If any of the items on the list apply, enter the appropriate information in the areas provided on the form.

Special instructions or recommendations should be entered on the special instructions or recommendations form. The following list gives examples of special instructions or issues:

- Packaging restrictions at the facility, such as size and weight limitations
- Special delivery procedures
- Special equipment required for installation, such as tracking or hoists
- What time the facility is available for installation (after the equipment is unloaded)

- Special security requirements applicable to the facility, such as security clearance

Figure 3-1 Delivery Survey (Part 1)

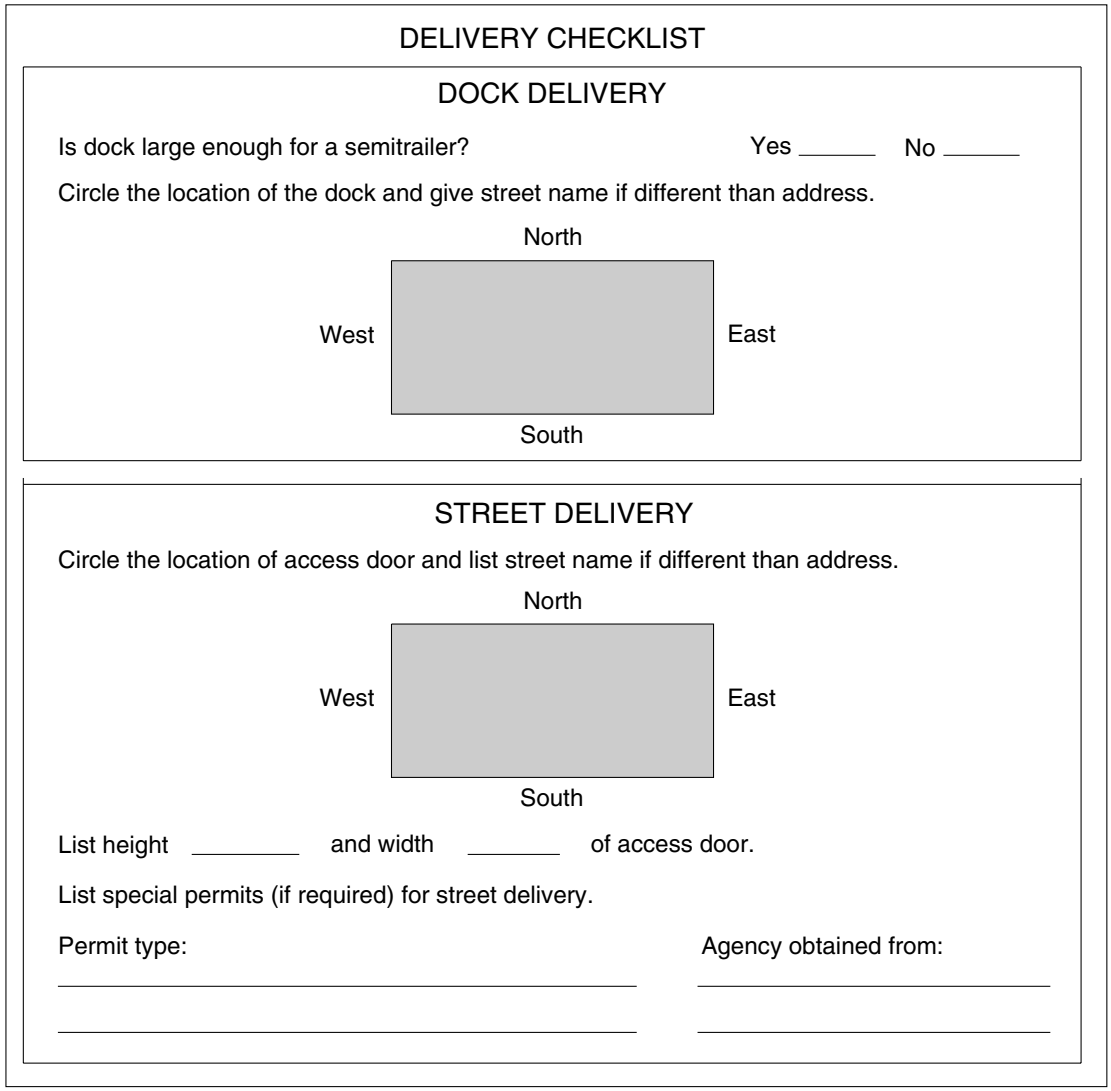
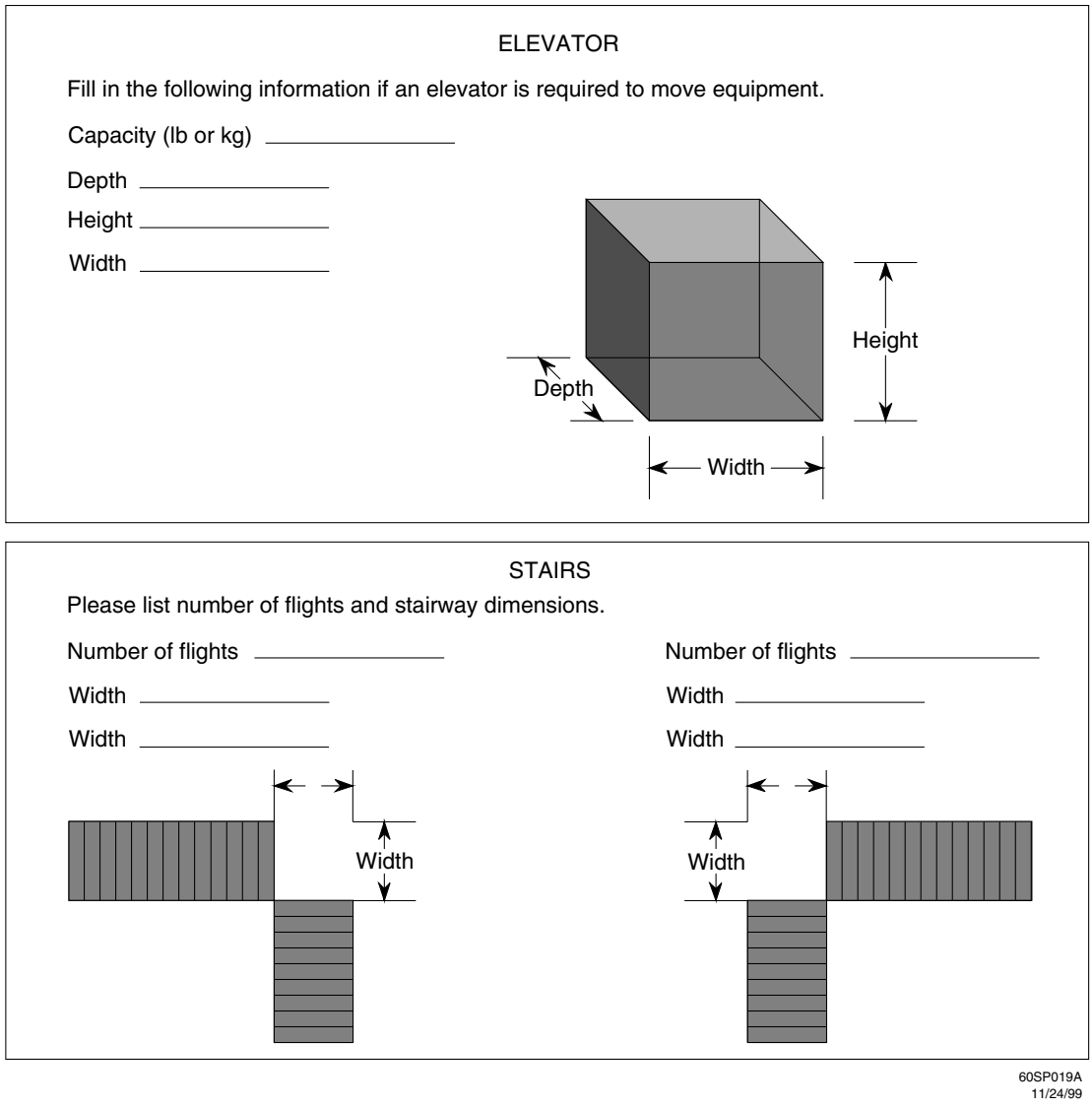


Figure 3-2 Delivery Survey (Part 2)



A System Requirements Summary

This appendix summarizes the requirements that must be considered in preparing the site for the hp rp7405/rp7410 server.

Power Consumption and Air Conditioning

To determine the power consumed and the air conditioning required, follow the examples in Table A-1 and Table A-3, then complete the entries in Table A-2 and Table A-4.

NOTE When determining power requirements you must consider any peripheral equipment that will be installed during initial installation or as a later update. Refer to the applicable documentation for such devices to determine the power and air-conditioning that is required to support these devices.

Table A-1 Example Power Consumption (Theoretical Maximum) and Air Conditioning Requirement Summary

Component	Quantity	Multiply Quantity By:	Power Dissipated (kilowatts)	Air Conditioning Required (tons) (kilowatts/3.517 =tons)
Chassis	1	426	426.00 (.426)	0.121
Cell Board (PA8700)	2	746	1492.00 (1.492)	0.424
PCI Card (Maximum 25W)	16	25	400.00 (.400)	0.114
Power Supply (BPS)	2	125	250.00 (.250)	0.071
DVD	1	20	20.00 (.020)	0.006
Disk Drive	4	25	100.00 (.100)	0.028
Core I/O	2	70	140.00 (.140)	0.040
PCI Power Supply	2	47	94.00 (.094)	0.027
		Total	2922.00 (2.922)	.831

Table A-2 Power Consumption (Theoretical Maximum) and Air Conditioning Requirement Summary

Component	Quantity	Multiply Quantity By:	Power Dissipated (kilowatts)	Air Conditioning Required (tons) (kilowatts/3.517 =tons)
Chassis	1	426	426.00 (.426)	0.121
Cell Board (PA8700)		746		
PCI Card (Maximum 25W)		25		
Power Supply (BPS)		125		
DVD		20		
Disk Drive		25		
Core I/O		70		
PCI Power Supply		47		
		Total		

Power Consumption and Air Conditioning Requirement

Table A-3 Example Power Consumption (Typical) and Air Conditioning Requirement Summary

Component	Quantity	Multiply Quantity By:	Power Dissipated (kilowatts)	Air Conditioning Required (tons) (kilowatts/3.517 =tons)
Chassis	1	330	330.00 (0.33)	0.094
Cell Board (PA8700)	2	500	1000.0 (1.00)	0.284
PCI Card (25W max)	16	10	160.00 (0.16)	0.045
Power Supply (BPS)	2	49	98.00 (.098)	0.027
DVD	1	20	20.00 (0.02)	0.006
Disk Drive	2	25	50.00 (0.05)	0.014
Core I/O	2	29	58.00 (0.058)	0.016
PCI Power Supply	2	47	94.00 (0.094)	0.027
		Total	1810.00 (1.810)	0.513

Table A-4 Power Consumption (Typical) and Air Conditioning Requirement Summary

Component	Quantity	Multiply Quantity By:	Power Dissipated (kilowatts)	Air Conditioning Required (tons) (kilowatts/3.517 =tons)
Chassis	1	330	330.00 (0.33)	0.094
Cell Board (PA8700)		500		
PCI Card (25W max)		10		
Power Supply (BPS)		49		
DVD		0		
Disk Drive		25		
Core I/O		29		
PCI Power Supply		47		
		Total		

Maximum power is the sum of the worst case power consumption of every subsystem in the box, and should be used to size worst case power consumption. Typical power consumption numbers are what HP engineers have measured running power intensive applications. These are generally lower than maximum power numbers due to the fact that getting all of the subsystems in the box to simultaneously draw maximum power for long durations being uncommon.

Weight

To determine overall weight, follow the examples in Table A-5, then complete the entries in Table A-6.

Table A-5 Example Weight Summary

Component	Quantity	Multiply By	Weight (kg)
Cell Boards	2	19.81 lbs (9.00)	39.62 lbs (18.00)
PCI Card (varies - used A3739B here)	4	0.34 lbs (0.153)	1.36 lbs(0.61)
Power Supply (BPS)	2	18.0 (8.2)	36 lbs (16.40)
DVD	1	2.2 lbs (1.0)	2.2 lbs (1.0)
Disk Drive	4	1.6 lbs (0.73)	6.40 lbs (2.90)
Chassis with skins and front bezel cover	1	131 lbs (59.42)	131 lbs (59.42)
		Total weight	216.58 lbs (97.68)

Table A-6 Weight Summary

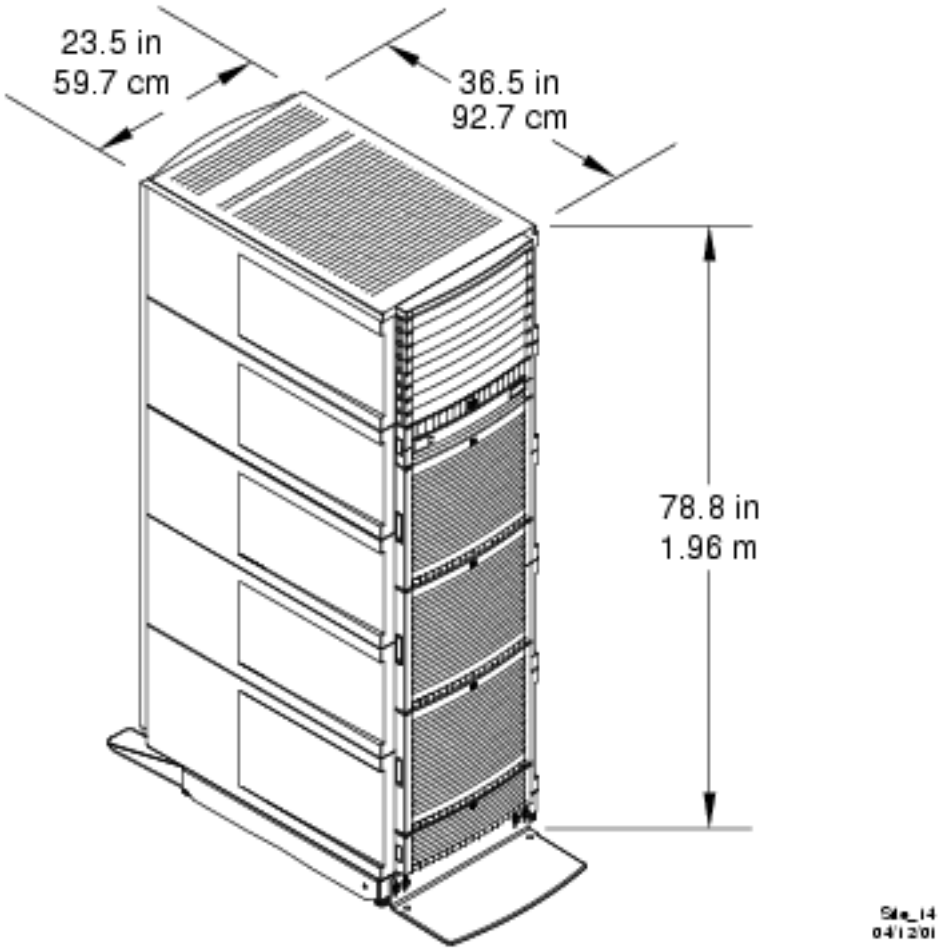
Component	Quantity	Multiply By	Weight (kg)
Cell Boards		19.81 lbs (9.00)	
PCI Card		varies lbs	
Power Supply (BPS)		18 (8.2)	
DVD		2.2 lbs (1.0)	
Disk Drive		1.6 lbs (0.73)	
Chassis with skins and front bezel cover		131 lbs (59.42)	
		Total weight	

B Templates

This appendix contains blank floor plan grids and equipment templates. Combine the necessary number of floor plan grid sheets to create a scaled version of the computer room floor plan.

Figure B-1 illustrates the overall dimensions required for an hp rp7405/rp7410 system.

Figure B-1 hp rp7405/rp7410 Space Requirements



Equipment Footprint Templates

Equipment footprint templates are drawn to the same scale as the floor plan grid (1/4 inch = 1 foot). These templates are provided to show basic equipment dimensions and space requirements for servicing.

The service areas shown on the template drawings are lightly shaded.

The equipment templates should be used with the floor plan grid to define the location of the equipment that will be installed in your computer room.

NOTE Photocopying typically changes the scale of drawings copied. If any templates are copied, then all templates and floor plan grids must also be copied.

Computer Room Layout Plan

Use the following procedure to create a computer room layout plan:

Step 1. Remove several copies of the floor plan grid.

Step 2. Cut and join them together (as necessary) to create a scale model floor plan of your computer room.

Step 3. Remove a copy of each applicable equipment footprint template.

Step 4. Cut out each template selected in Step 3; then place it on the floor plan grid created in Step 2.

Step 5. Position pieces until the desired layout is obtained; then fasten the pieces to the grid. Mark locations of computer room doors, air conditioning floor vents, utility outlets, and so on.

Figure B-2 hp rp7405/rp7410 Cabinet Template

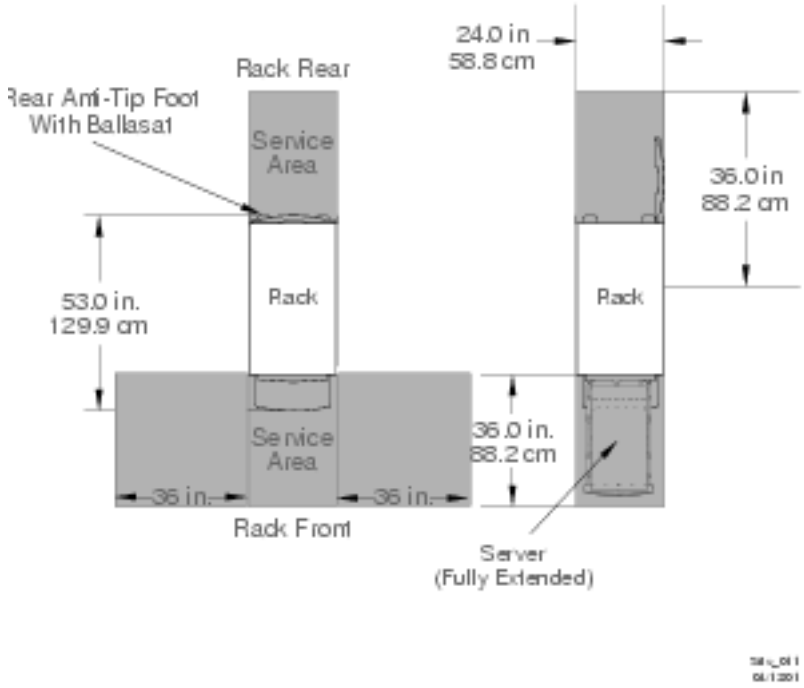
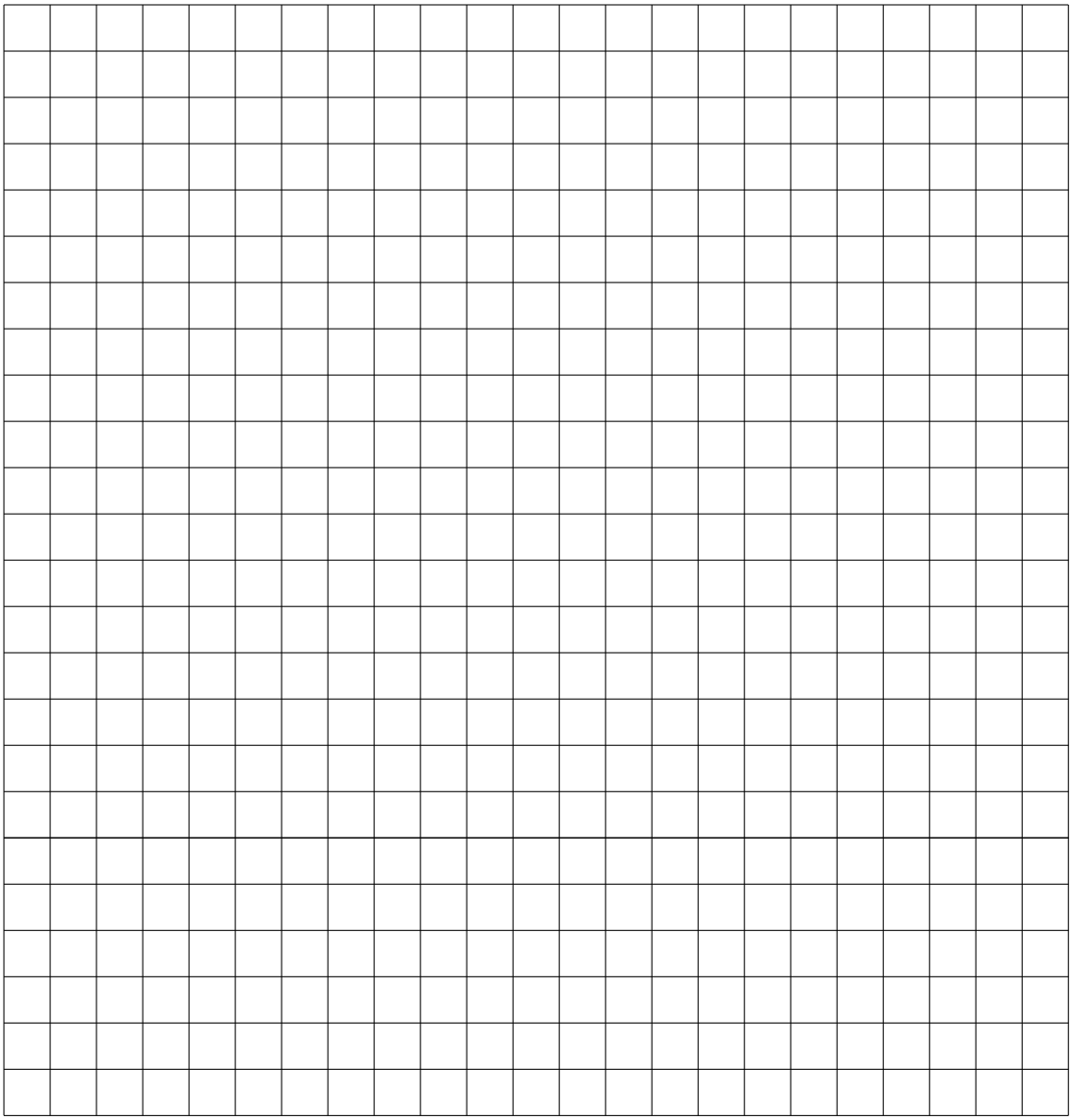


Figure B-3 Planning Grid

Scale: 1/4 inch = 1 foot



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